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ABSTRACT

Four lessons for secondary school geography instruction focus on creative thinking through generating alternatives, imagining consequences, generating analogies, and creating products. In lesson 1 students lay out alternatives to solving a problem and decide the best course of action. Suggested activities include consideration of alternatives in providing free public schooling to aliens in Texas, insulating a solar water heater, and providing mass transit in an urban area. Suggestions for brainstorming techniques in ecology, geography, energy, and economic/geography units are also provided. Lesson 2 focuses on imagining consequences of personal and societal actions. Students generate consequences to such issues as raising the highway speed limit, giving Puerto Rico independence, and abolishing restrictions to immigration. Group activities involve scenarios requiring allocation of limited resources. In lesson 3, students create analogies to aid in unlocking long-term memory and projecting implications of various courses of action. Several worksheets involve students in creating simple and complex analogies. Lesson 4 focuses on producing creative products, using the criteria of the student's practical knowledge, originality, competence, moral or aesthetic sensitivity, and excellence. (KC)

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DEVELOPING STUDENT CREATIVITY IN GEOGRAPHY CLASSES:

FOUR "HOW TO DO IT" PAPERS FOR CLASSROOM TEACHERS

by

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and

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SO 014 514

Paper presented at the Annual Meeting of the National Council for Geographic Education (San Diego, CA, October, 1982).

DEVELOPING CREATIVITY IN GEOGRAPHY I:

GENERATING ALTERNATIVES

Even the most casual reviewer of objectives for geography courses will not fail to see creativity as a concern. Almost all geography teachers will maintain that they hope to help their students become more creative, especially as creative problem-solvers. Their objectives recognize that creativity does not occur in youth or adults by accident, but by learning and practice.

Our first image of creativity and the creative person emerges from the arts and humanities. Here the creative person is seen as a producer of some poem, story, painting, or physical object which is admired as exceeding the standards of excellence in its field.

But there is a second image of creativity, more in tune with geographic education and citizenship, which deals with process. Here the creative person is known by his or her "creative cognition:" that is, the discovery of some relationship which is insightful for solving a personal or public policy problem. Every time a student "discovers" the validity of a generalization about the environment and human behavior, he is engaged in creating anew the cognitions which link a myriad of perceptions. When the student leaps to a new hypothesis, perceives a range of alternatives open to a policy decision-maker, or discovers analogies to an ethics case, he or she is engaged in creative cognition.

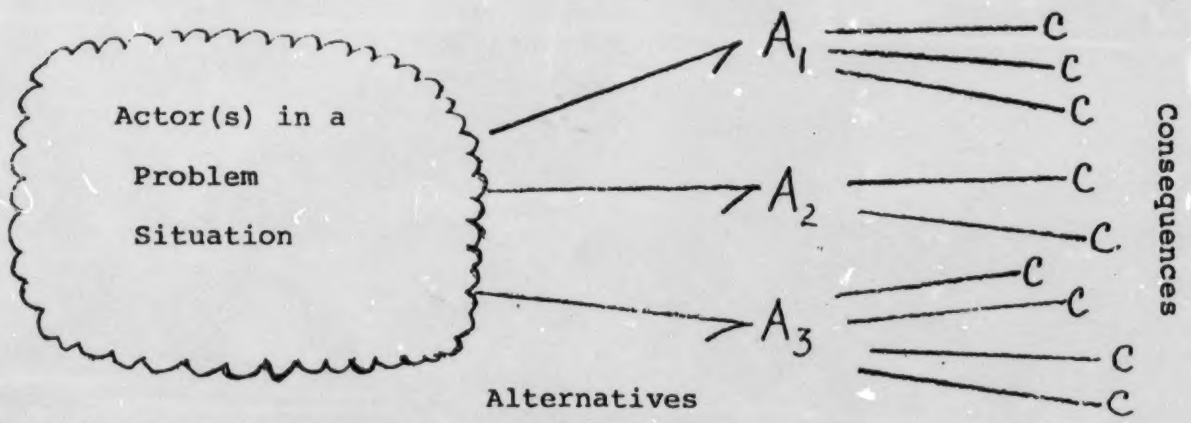
The first function of creative cognition, and the one we shall focus on in this article, involves the ability to lay out alternatives. For example, given traffic congestion in an inner city area, students might be asked to simulate the work of city planners and devise new traffic alternatives to existing patterns. Given an interest in an historic landmark no longer in use and threatened by bulldozers,

students might design alternative and constructive uses for this old structure in the 1980's.

Similarly, in a recent episode of Bill Moyer's PBS series, Creativity, students were given a wooden shuttle from an eighteenth century loom and asked to identify it by its function. To do this, the students had to play out alternative uses and to reason and use knowledge to accept or reject the alternatives suggested. The ability to imagine alternative uses was the critical first step in the task. Without imaginative powers (which psychologists call "spontaneous flexibility"), the students were at a dead end.

Creativity as the generation of alternatives is not a mere academic exercise, but is practical. For example, take Mary's situation. Her utility bills have been soaring well over her budget. If she is to take effective action and survive solvent, she must discern alternative courses of action to reduce her consumption of electricity. Mundane perhaps, but vital to Mary and most other householders.

In any decision-making situation, the task facing the actors after understanding their problem is to lay out the alternatives and make a decision as to the best course of action (see Figure 1).



The leap from problem to alternative courses of action (solutions) is a creative one.

Figure 1

Many decision-makers are restricted in making good decisions, not by their values or understanding, but by their creative ability to discern the array of alternatives open to them.

Three styles of laying out alternatives are:

1. Alternatives for ethical decision-making
2. Alternative uses to accomplish a task
3. Alternative generation in problem-solving

Alternatives for Ethical Decision-Making

Students, who have read Kohlberg's Heinz case about stealing a drug to cure a dying wife, have to first perceive the many alternatives open to Heinz before making ethical/moral judgments about proper behavior.

Students, who are making judgments about the appropriate use of nuclear weapons against Japan, need to first lay out the alternative courses of action open to U.S. policy-makers.

Students, who are making moral judgments about free public schooling for aliens in Texas, need first to lay out the alternatives open to all the actors in that dilemma.

Alternative Uses to Accomplish a Task

Students who have studied energy conservation strategies in the context of housing might be assigned to generate ways to:

insulate a solar water heater, or a household water heater;

prevent solar radiant heat buildup on the south and west sides of a home;

use biomass "waste" in a woodlot;

use Florida's water hyacinth as an energy source;

shade windows to minimize solar heat gain;

vent an attic area to minimize moisture damage and heat loss or gain.

Alternative Generation in Problem-Solving

Students who have studied the energy crisis in the United States need to generate a broad spectrum of alternatives open to persons and policy-makers as part of the decision-making process:

alternative ways to provide mass transit in an urban area;

alternative incentives to revive the use of rail urban transit in Philadelphia;

alternative incentives to revitalize the nation's rail system;

alternatives open to policy-makers trying to reduce gasoline consumption by private vehicles in Georgia.

In each of the above situations, students are called upon to be creative by imagining alternatives.

Brainstorming. This is a freewheeling process first developed by Alex F. Osburn (1957) which has become popular in real problem solving situations in industry and in educational circles. Osburn recognized that many creative ideas were never expressed due to a fear of ridicule. Therefore, his strategy of brainstorming does not permit a critical review of ideas until the group has exhausted its list of creative solutions.

In the classroom, a leader warms up the group to the problem at hand. Then, in a free response style, group members suggest solutions without permitting any critical remarks. Each suggestion is recorded on the chalkboard or butcher paper. The "piling up" of creative alternatives is intended to spur on the creativity of all group members. This is the idea-producing process. Later, the group enters the idea-evaluation process wherein the ideas are critically evaluated and tried out to discern what works.

For example, in a unit on urban renewal, a problem arises about ways to cut costs by recycling materials reclaimed from old structures. The teacher presents used bricks as one available resource. Students

are prepared and are asked to think of as many uses as they can in ten minutes for reclaimed bricks from urban renewal areas. Later, they will separate the cost-effective uses and share them with appropriate officials, as a report on a portion of their studies of urban renewal and recycling in an era of increasing austerity.

Brainstorming might be used in each of the following instructional settings:

Ecology Unit:

1. Productive Stage: Given our study of wildlife habitats in the Everglades area, list as many actions as you can that persons can take to enhance the habitat for alligators, deer, and black bears.

   Evaluation Stage: Rank order the three best actions, after considering a) cost effectiveness, b) likely benefit of the action for habitats, and c) least negative impact on water volume and quality.

2. Productive Stage: Given our study of this area of abandoned open-pit iron ore mines, list as many ways as you can to beautify an abandoned open-pit mine for recreational purposes.

   Evaluation Stage: Rank order the ten best actions given the costs involved, assessed against the benefits received in beautification and recreation.

Geography Unit:

1. Productive Stage: Given your study of Iranian village agriculture, list as many alternative ways as you can imagine to irrigate farm plots.

   Evaluation Stage: Select the better irrigation ideas, given the limitations of a) village technical potential, and b) capital outlay requirements.

2. Productive Stage: Given our study of coal mining in the United States, list as many ways as you can for getting deep coal to the surface.

   Evaluation Stage: Once your listing is exhausted, have a student diagram each of the suggested ways. Then, as a group, identify the potential dangers or hazzards in each of the ways suggested.

Energy Unit:

1. Productive Stage: In small groups of five students, list as many sources of energy as you can to replace our limited fossil fuels.

Evaluation Stage: Divide the suggested sources into two categories--as to whether they contribute to the electrical pool of energy we need or to the chemical pool of energy we need (some might contribute to both).

2. Productive Stage: After our study of nuclear energy, list as many ways as you can for disposing of nuclear wastes.

   Evaluation Stage: Each student will select one suggested way and, after library research, write a brief position paper upon its feasibility (practicality) today.

Economic/Geography Unit:

1. Productive Stage: Given their study of the manufacturing and marketing process in a local shoe factory, students will generate a list of alternative ways to increase production in this plant.

   Evaluation Stage: Students will submit their list to local businesspersons for an evaluation of their ideas.

2. Productive Stage: Given their study of natural resources in south Georgia, students will generate a list of alternative ways to use farmland to maximize economic return.

   Evaluation Stage: Students will review their list with the school's vocational agriculture teacher and with parents who are farmers for their evaluation and reasoning.

Classroom Climate. The ideal classroom climate to foster creativity is open, supportive, and rewarding for creative behavior by students. Too much stress upon "getting the right answer" is retarding or inhibiting. Peer and teacher pressure can cut spontaneous responses (explaining why Osburn's brainstorming restricts evaluative comments in the productive stage).

The teacher needs to build opportunities for creativity within the topics which are under study as part of the curriculum and honor those students who improve their generation of alternatives and alternative uses. Opportunity to be creative, encouragement to be creative, and reward for being creative are the Trinity of principles for fostering creative learners in the geography classroom (Torrance, 1964).

The process in the classroom generally involves four phases:

1. Involvement and Warm-up. The creativity exercise needs to be a part of an ongoing instructional program, so that students understand the context of the problem and have the requisite knowledge to perform well. Creativity does not happen in ignorance, but is in part the application of knowledge and understanding. It also places the task in a meaningful context so that being creative contributes to achieving the purposes of studying the general topic.

2. Problem or Task. The teacher presents a problem or task to challenge the students' creative response. The task needs to be clear and specific. The teacher should set the ground rules: individual or group task, no pejorative or evaluative comments, etc.

3. Alternative Responses. Students cope with the problem or task and generate their best responses. Whether they present reasons for their suggestions and discuss them is up to the ground rules established, but students can piggy-back on others' ideas and share in any group creativity exercise.

4. Evaluation and Communication. Once the creative results are in, students and the teacher may begin to assess, critically, the results, measuring them against the task at hand. This is a rigorous testing of ideas and a critical one, but with appreciation for the many contributions of the individual or group.

Evaluation. Evaluating student performance on such creativity exercises as alternative generation and alternative uses is not difficult. Teachers can save student responses from October to compare with student responses on similar activities in January or May. Thus, teachers and students may gain feedback on their growth. In addition, teachers could administer tests such as the Guilford, et al (1978) Alternative Uses Test, Form B or C to serve as a pre- and post-test for their courses in geography. On a pre- and post-test basis, teachers and each of their students would get a hard measure on their growth in "creative cognition."

Conclusion. There is controversy as to whether educators can "train" persons to be more creative. Guilford (1950) pointed out that this is an untested hypothesis, as the evidence from studies is inconclusive. E. Paul Torrance (1964) and others have asserted that creative potential can be enhanced by systematic instruction.

It is clear to us that creative opportunities exist throughout a curriculum. Teachers can seize upon them to broaden a learner's cognitive skills and enhance his or her ability to perceive alternative uses and alternative courses of action.

Geography teachers can readily develop one creativity activity for each chapter or unit in their course as a beginning point. The activities suggested in this article are central to geographic education and no teacher should find them foreign to his or her course objectives. The opportunities to develop creativity are there in textbooks and course outlines. It is only left to concerned teachers to seize these opportunities and build them into the instructional sequence. To do less is to fail to take seriously our interest in educating creative citizens.

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DEVELOPING CREATIVITY IN GEOGRAPHY II:

IMAGINING CONSEQUENCES

Traditionally, geographic educators have focused upon convergent thinking; that is, we have had our students search for specific answers using given facts and transferring their knowledge of key concepts. This analytical kind of thinking is to be valued, but there are important places for divergent thinking in geography. Much of what we call problem-solving and decision-making involves divergent or creative thinking. Here students take what they know to generate new ideas, to trigger new perceptions, and to imagine new possibilities.

In a previous article we showed how the ability to generate alternative courses of action was important to geographic education and how this ability might be developed within regular geography courses. This article deals with consequences -- the ability to perceive the likely consequences of action and to imagine new possibilities for personal and social life beyond what is given (and is conventional). If during the Cold War we had taken advocates seriously and had bombed Peking and Moscow, what would have happened? What might happen if employees simply refused to dump pollutants into the water and air? What are the economic consequences of pursuing the value of "Free Trade" in American policy over the next thirty years?

Geographic education is in large measure developing the ability to see the consequences of personal and societal actions. We need to see what human actions have caused, are causing, and might cause to happen. Certainly, this requires that students have hard knowledge from geography and the other social sciences. But it also requires the creative ability to envision, imagine, or project what the short and long term results are for particular personal behaviors and public policy alternatives. Can we and our students clearly state what we

have done, are doing, and can do in the various situations where we are acting or our society is pursuing policy? Seeing the implications is a creative ability, based in part upon practical knowledge.

We will focus upon two kinds of imagining consequences as a creative ability:

1) Imagining consequences as the necessary step in decision-making for personal action or public policy; and

2) Imagining consequences as opening new possibilities for personal and social life.

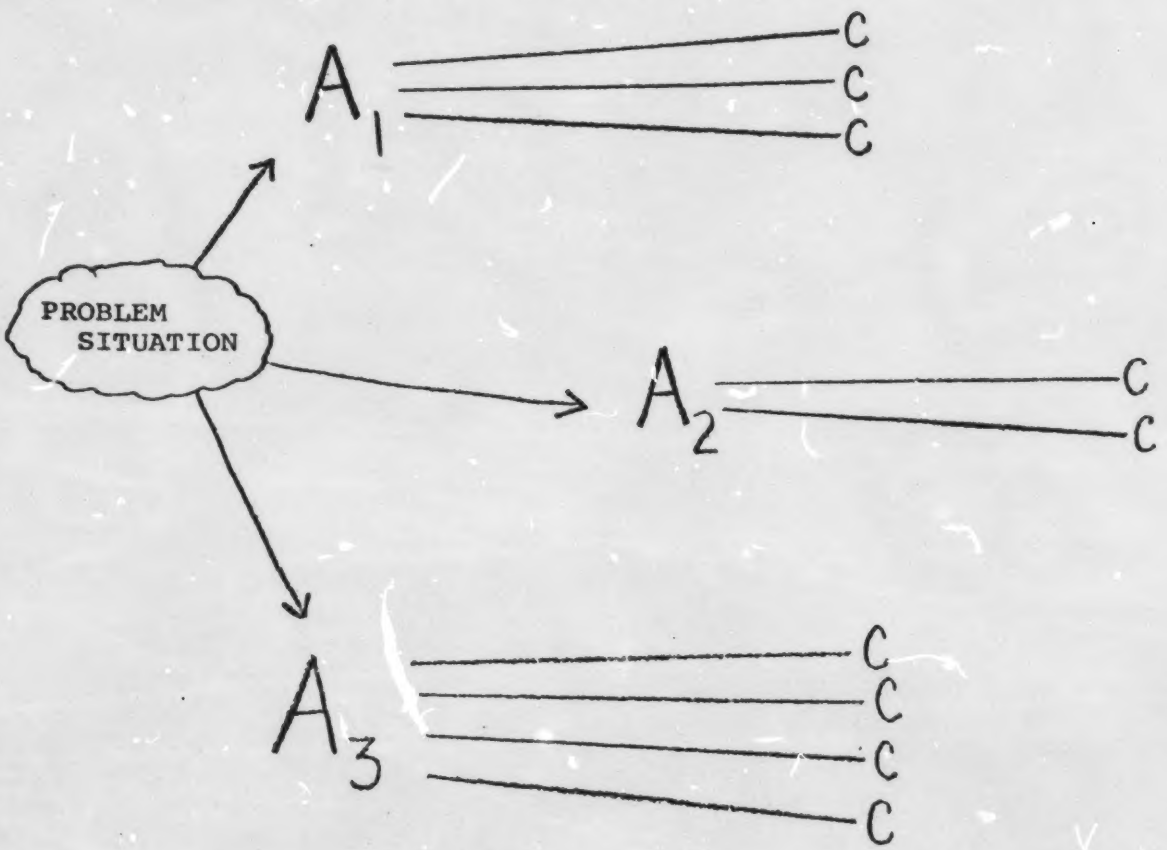
Decision-making and Consequences. Any time an individual, group, or society is in a problem or dilemma situation, they need to define the problem and lay out alternative solutions or courses of action. To assess these alternatives, it is first necessary to predict or to imagine the implications of following each of the alternatives (see Figure 1). This is a creative act -- one of perceiving the consequences. It requires knowledge, imagination, and time to reflect.

Consider the personal decision-making case faced by Tom:

> "Tom Jackson is a working man of forty-two, who for the past ten years has been saving money to buy a cottage in the Muscokas. Right after he purchased land for his cottage, he had the opportunity to sell it for a quarry. Tom is a member of the Bruce Trail Hikers' Federation and is concerned about environmental quality. But he can sell the land for ten times what he paid for it, enough to buy an isolated 200 acres and build his home! Fellow landowners around the potential quarry site urge Tom not to sell them out -- their property will be ruined by the noise, traffic, and dust."

Decisions on this case will be based upon the consequences of the alternatives open to Tom. Some of the consequences are obvious, others are just as real but more remote. Values come into the process only as Tom evaluates the alternatives by looking at the consequences, selecting the alternative with the most positive or the least negative implications.

The same process is used for public policy decisions. Consider the following sample activities for laying out the consequences for



The leap from alternatives to consequences is a creative one, requiring preparation and knowledge.

Figure #2

proposals (alternatives) we have for "solving" societal problems.

What would happen if?

1. We had prohibited all strip-mining?
2. We raised the highway speed limit to 80 m.p.h.?
3. We abolished property taxes and used only sales taxes to support local and state government?
4. We gave Puerto Rico its independence?
5. We refused to export American-produced food to other nations?
6. We nationalized ownership of railroad tracks and facilities in the United States, as we have done for major highways?

Imagining New Possibilities. Students as part of their study of geography or contemporary life can look at alternatives to existing conventions. Robert F. Kennedy was fond of this creative approach to dealing with problems. And he was often misquoting George Bernard Shaw when he said: "Some people look at what is and ask 'Why?' I dream about what might be, and ask 'Why not?' " Dreaming about new possibilities and their consequences is an imaginative, creative activity which is appropriate to geography.

The following are sample activities for geography students to generate consequences and their implications for imagining new ways to be and live together. Some examples are more serious than others.

1. What if people did not die?
2. What if all trees were made of plastic?
3. What if birds got tired of eating insects?
4. What if there was no litter?
5. What if we all had to dispose of our own trash and waste?
6. What if we had to slaughter animals in order to eat meat?
7. What if fast food "joints" did not wrap their products in so much paper and plastic?
8. What if the United States did not restrict the inflow of immigrants?

9. What if everyone got an equal share of what is necessary to sustain life, without that share depending upon their work output?

10. What if the United States had 500 years supply of oil and natural gas?

11. What if we could invent and build for $5,000 a small urban car (for two passengers) which would get 180 miles per gallon?

Geography:

1. List all possible consequences of reversing the seasons in North America so that the winters were warm and the summers frigid.

2. What would be the possible results if the polar ice caps melted and the sea level rose 40 feet?

3. What would be the consequences if the illiteracy rate in the United States rose to 30% of the adult population?

4. What might happen if longitude and latitude had never been devised as a location system on Earth?

5. What would be the consequences of using up world supplies of natural gas and petroleum, so that crude oil costs $300 a barrel?

6. List the consequences to urban life if all cities in the United States had more than 50% of their population below the government's poverty line.

7. What might have been the consequences, if European nations had not divided Africa below the Sahara into colonies (which later became nations)?

8. Divide your class into three groups, placing each group into the following situation -- with limited resources. Let the groups work for 30 minutes on their task and then present them with the "new developments" for their group...

Situation: With 11 other adults and three children, you have been stranded upon a small, tropical island. The island is three miles wide and five miles long, with mountains, trees, rich soil, and a good fresh water supply. The lagoon is clear and sparkling. Fortunately, you have the following items to work with as you set up a government and an economy:

2 lifeboats, damaged beyond repair
2 canteens
6 blankets
6 oars

3 coils of nylon rope (500 ft. each)	1 flare gun and 3 flares
2 hand axes and 5 knives	6 empty tin cans
1 copy of the Torah	1 dozen bottles
15 lifejackets	1 first aid kit
3 fish hooks and 100 yards of line	10 copies of Newsweek
3 tins of sterno (canned heat)	6 pencils and 100 sheets of paper

New Developments: Another shipwreck occurs. 15 adults come ashore without any resources. They too want to survive. What are the possible consequences for your island lifestyle?

Evaluation. Evaluating student performances on such creativity exercises as projecting consequences (obvious and remote) is not difficult. Teachers can save student responses from October to compare with student responses on similar activities in January or May. Thus, teachers and students may gain feedback on their growth. In addition, teachers could administer tests such as the Guilford, et al. (1980) Consequences, Form A I & II to serve as a pre- and post-test for their courses. On a pre- and post-test basis, teachers and each of their students would get a hard measure on their growth in "creative cognition."

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DEVELOPING CREATIVITY IN GEOGRAPHY III:

GENERATING ANALOGIES

Geography teachers are interested, not only in the learning of knowledge, but in having their students apply that knowledge to perceive relationships. They develop application activities to this purpose, hoping all the while for their students' creativity to emerge.

It is our experience that having students generate analogies is one effective way to foster creativity and to stimulate students' abilities to use knowledge in practical ways.* As we taught about energy issues, we noticed that students learned the facts, but had difficulty in perceiving the meaning of those facts and concepts in situations where relationships were important. To correct this problem, while stressing practical application and creativity, we developed our use of analogies.

Why Analogies? Analogy appears to foster creative thinking in at least two ways. First, research shows it helps to unlock long term memory. Maier (1970) feels that his research shows that highly creative persons encode and retrieve information in differently than low and moderately creative persons. Tapping the unconscious is an important part of creativity (Guilford, 1967). Analogy provides access to the unconscious by a different path. For example, in considering solutions to traffic problems in cities, exploration of ant colonies, bee hives, conveyor belt systems in factories, and other situations where things and animals are moved from place to place may suggest new solutions that may never have been considered by concentrating only on the original problem. Thus, the first role of analogy is to help unlock the vast storehouse of long-term memory.

A second function of analogies is in projecting the implications of various courses of action or in testing the values claims made in

an argument. Guilford (1967) identifies this as Cognition of Implications. This ability helps us to explore the consequences and implications of various courses of action. For example, when considering the safety of new chemicals, a researcher may recall that heroin was originally hailed as a safe cure for morphine addiction. This analogy might well lead her to explore the hazzards, real and potential, of her new chemical compounds. The breakthrough in using fluorocarbons in spray cans turned out to be less innocent, damaging the ozone layer which protects life on earth. Such analogies are cautions to further thought and research into consequences.

Similarly, in an argument persons will use value principles and reasons to support a personal moral judgment or a public policy suggestion. Analogies come into play as one wants to support or to refute the reasons or principles. For example, one student has argued that soldiers commit great evils in that they kill human beings. Another student offers an analogy to test that judgment, noting that "If an intruder, who was armed, came into your home and threatened to murder your family and you had access to a gun, you might well use that gun to protect your family. Would that be 'evil'?" The second student has used an analogy--real or hypothetical--to point up a potential inconsistency to get the first student to modify or at least clarify her original position. In another example, a student might well argue that the patriots in the American revolution were justified in trying to break off with England and to establish a new nation. The teacher, drawing an analogy, might respond by asking if the Southern States were also justified in rebelling with the purpose of establishing a new nation. The point here is that analogies are commonplace in public discourse on personal and social issues and that students need the creativity ability to generate analogies if they are to reason effec-

tively.

At an appropriate place in their geography courses, students might see this limited use of analogies in explanation and argumentation by thinking through analogies such as the following:

"Why might someone say that 'Italy is the boot of Europe'?"

"Why might someone claim that 'The struggle of the Irish in Northern Ireland today is like our American Revolution'?"

"Why might someone claim that 'Government programs for the poor are like the alchemist's dream of turning lead into gold'?"

"Why might someone claim that 'Today's economic crisis is just like that of the Great Depression of the 1930's'?"

As useful as analogies are, however, there are real limitations. The analogy cannot be carried too far. Analogies are not "proof," or a substitute for research and hard facts. For example, Gibbon's Rise and Fall of the Roman Empire is fertile ground for analogies with contemporary American life. It would be fallicious to argue that, because X, Y and Z were present in the declining years of Rome and those factors are present today, the United States is on its last legs. Analogies do not prove, but offer insights to guide inquiry and to clarify principles and positions.

Analogy might best be compared to a rubber band (to use an analogy). It is useful until it is stretched too far, and then it breaks.

Simple Analogies. Analogy, from the Latin for proportionate, deals with the perception of likeness or similarity in things which are otherwise dissimilar. In the perception of analogies, two thoughtful acts are involved: 1) seeing the likeness or similarity involved, and 2) explaining the relationship or similarity that one perceived.

Using the simple analogy that "X is somehow like Y," we would always ask students to explain the relationship. For example, classroom questions would follow this form:

1. How is driving your car at 75 m.p.h. today like diminishing

your grandchildren's quality of life?

2. How is conserving paper like planting a tree?

3. How are the Mississippi River and its tributaries like the body's circulatory system?

4. How is a pipeline like a railroad?

These queries would be replaced later by letting students generate the analogy and then explain it. We would begin with a "fill in the blank(s)" and provide an explanation:

1. Operating your car with underinflated tires is like (running in sand).

2. A one-half inch crack under an outside door at home is like having (an 18-square inch hole in the door).

3. Using incandescent bulb with too high wattage for your needs is like (killing a housefly with a .45 cal. pistol).

Simple Analogies: Sample Energy Items

1. Highway driving at 75 m.p.h. is like_____.
2. Driving a poorly tuned car is like_____.
3. Unshaded exterior walls soak up solar radiation like_____.
4. Using black roofing material is like_____.
5. Having an uninsulated water heater is like_____.
6. Driving a huge V-8 automobile today is like feeding_____.
7. High energy consumption is like_____.
8. Relying on government to solve energy problems is like_____.
9. Using corn to make gasohol in a hungry world is like_____.
10. Using electricity to heat water in Florida is like_____.
11. Failing to insulate your home is like_____.
12. Not fixing a dripping hot water faucet is like_____.
13. Constantly opening your refrigerator or freezer door is like _____.
14. Leaving a school door open in winter is like_____.

15. Waiting for O.P.E.C. to sharply lower crude oil prices is like _____.

16. Thinking that the U.S. will become energy independent is like _____.

17. Using mass transit when available is like_____.

18. Relying on U 235 to fill our energy needs is like_____.

19. Drilling for geothermal energy in Georgia is like_____.

20. Installing an expensive wind generator for electricity in Florida is like_____.

More Complex Analogies. Once students are able to deal effectively with simple analogies, we have posed multiple analogies of two types. First, there is a form where three elements are given: "X is to Y, as Z is to _____." Examples of this type are:

1. Nicotine is to smokers, as gasoline is to (Americans).
2. Showers are to baths, what Ford Escorts are to (Lincolns).
3. Horsepower is to automobiles, as _____ is to electric motors.
4. Glazing is to household heat loss, as _____ is to the freshness of a bottle of Coke.

Students are to supply the missing element, showing their perception of the analogy and explaining the relationship involved.

A second form of the multiple analogy provides only two elements and has two unknowns: "A is to B, as _____ is to _____." Students are asked to perceive a relationship in the first part (A is to B) and to provide an analogous pair in the blanks provided. Examples are:

1. Using (electricity) to heat (household water) in Florida is like plowing your garden with a Cadillac El Dorado.
2. Bauxite is to aluminum, as (crude oil) is to (gasoline).
3. Saving is to spending money, as (conservation) is to (energy consumption).

Multiple Analogies: Sample Energy Items

Type: x is to y, as z is to _____.

1. Flour is to cake as _____ is to solar water heating.
2. Interest is to savings, as _____ is to a solar water heater.
3. _____ is to energy, as a wolf is to sheep.
4. _____ is to energy, as fish are to mosquito larvae.
5. Natural gas is to electric power generation, as _____ is to food production.
6. Solar energy is to the future, as _____ was in the past in our industrial revolution.
7. A raft is to a drowning person as energy conservation is to _____ _____.
8. Solar energy is to fish in a lake ecosystem, as _____ is to humans in an urban system.
9. Insulation is to _____, as feathers are to a duck.

Type: a is to b, as ___ is to ___.

10. 55 m.p.h. speed limits are to saving gasoline, as _____ is to _____.
11. Solar energy is to household water heating, as _____ is to _____.
12. Putting a solar collector on your roof to heat water is like putting _____ in the ground to _____.
13. Burning coal is to air quality, as _____ is to _____ _____.
14. Geothermal energy is to the West, as _____ is to _____ _____.
15. Caulking is to air leaks in houses, what _____ is to _____.
16. Recycling aluminum cans is to bauxite, as _____ is to _____.
17. Going outside in the winter without a coat is like _____ without _____.
18. Using _____ to make _____ is like employing a skilled teacher to collect lunch money.
19. Conservation is to high grade energy resources, as _____ is to _____.

Either of the forms of the more complex analogies can be used as multiple choice items, such as those common on aptitude tests. Teachers might occasionally use this form to vary the tasks in generating analogies. A sample is:

"Recycling aluminum cans is to bauxite deposits as:

a. dams are to hydroelectric power;

b. scrap steel yards are to iron ore deposits;

c. copper tubing is to electricity; or

d. none of the above."

In such items, the emphasis upon creativity is diminished to heighten the focus upon the study of relationships.

Analogies in Decision-making. Analogies are real or hypothetical situations used to test someone's consistency in decision-making on moral or public policy decisions (Newmann and Oliver, 1970). Students who have studied, reflected, and come to a decision on a value conflict situation are given an analogous situation. Is their decision in the second case consistent with the first? For example, if a student after examining the Cold War of the 1950's decides that the U.S. should have A-bombed Moscow, then she might be asked if she would have advocated bombing Peking as well. If another student argued that the patriots of the American revolution fought a just war to establish their independence, would she remain consistent on an analogous case involving the Rebel Cause during the War of the Southern Rebellion in the United States? If students remain consistent, they need to examine the case and its analogy and show the commonalities in the two situations. If they are not consistent, they must show that the two cases are different in a substantive way, articulating the dissimilarities.

Newmann and Oliver (1970) developed practical exercises in analogy-

generation for students discussing public issues. For example, they gave students a list of value claims and asked them to think up a situation that would contradict or be an exception to the general value claim:

Value Claim:	Challenging Analogy:
1. We all have the right to freedom of speech.	1. (a case involving someone yelling "Fire!" in a crowded theatre)
2. We should always obey the law.	2. (a case where a father speeds his daughter to the hospital in order to save her life)
3. We should tell the truth.	3. (a case where a girl walks away and refuses information-gossip--to a curious group to save her friend's feelings
4. Scientists have the first obligation to warn the public and their colleagues of the risks in their new technology.	4. (a case where a corporation scientist fears for his job if he publishes critical information about a new produ

Another strategy is to provide students with a case study (situation) involving a value conflict, and ask students to write up an analogous case situation. Students studying the discovery of the Tasaday people in the Philippines face the controversy as to whether this ancient culture should be left alone, out of contact with the modern world, or whether they should be exposed to other ways of life, leaving choices open to them. Analogies might be generated involving the education of Amish children in the United States and Canada; Christian missionary activity in the Third World; Western-style education offered to selected elites in the Third World; and state-required education for youth. One way to see the Tasaday issue is the tension between freedom and cultural integrity.

Students examining Micronesia in their geography course might examine the imposition of a "trusteeship" following World War II where the United States was to help the islanders prepare for future

independence. Here the issue may be seen as turning on the conflict between freedom and paternalism. What are some analogous cases? Students might look to other, earlier forms of "trusteeship" under the League of Nations. The required education of youth offers additional analogies--education required to age 16, required courses, and so forth. Analogies might also be found in apprenticeship programs, correctional institutions, and required helmets for cyclists.

Students studying OPEC and oil dependency in other nations might generate analogies in American history when groups tried to control (or "corner the market") on vital resources for their own gain. Seen differently, students might see the OPEC price setting scheme against a likely analogy in the high severance taxes imposed by several coal-rich Western states in the United States.

As any geography teacher who has spent time in neighborhood bars or in faculty lounges knows, popular debate on public issues and moral decisions is invariably filled with reasoning with analogies. It is an appropriate and time-honored strategy for clarifying positions and value principles. But it is an act of creativity which must be learned over time, with practice.

Classroom Climate. The ideal classroom climate to foster creativity is open, supportive, and rewarding for creativity behavior by students. Too much stress upon "getting the right answer" is retarding or inhibiting. Peer and teacher pressure can cut off spontaneous generation of analogies to the subject under study or the value conflicts and issues being argued.

The teacher needs to build opportunities for being creative within the topics which are under study as part of the curriculum and honor those students who develop appropriate and especially creative analogies. Opportunity to be creative, encouragement for being

creative, and reward for being creative are the Trinity of principles for fostering creative learners in geography (Torrance, 1964).

Conclusion. There is controversy as to whether educators can "train" persons to be more creative. Guilford (1950) pointed out that this is an untested hypothesis, as the evidence is inconclusive. E. Paul Torrance (1964) and others have asserted that creative potential can be enhanced by systematic instruction. It is clear that creative opportunities exist throughout a geography course. Teachers can seize them to broaden a learner's cognitive skills and enhance his or her ability to generate analogies. The opportunities are there in the textbooks and course outlines. It is up to us. To do less it to fail to take seriously our avowed interest in educating creative and effective citizens.

*Analogies are a third type of creative cognition. Earlier articles dealt with alternative uses and projecting consequences as functions of students' creative cognition abilities.

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DEVELOPING CREATIVITY IN GEOGRAPHY IV:

PRODUCING CREATIVE PRODUCTS

Even the most casual reviewer of the objectives for geography courses will not fail to discern student creativity as a concern. Almost all geography teachers maintain that they want to help their students to become more creative, especially as creative problem-solvers. Their objectives recognize that creativity does not occur in youth or adults by accident, but by learning and by practice.

Much has been written about creative persons, creative products, and the creative process. These terms are used loosely, and thus, creativity is frequently used without any careful attempt to define just what is meant. Some definitions of creativity are formulated in terms of a product, such as an invention or discovery or painting; others are formulated in terms of a process. All suggest that the outcome must be original or new to the person or to the culture. While some definitions tend to be elitist and reserve "creative" to very rare and particularized kinds of ability, others apply the term to a general ability possessed to some degree by almost everyone.

The confusion is aided by the fact that there are two kinds of creativity. Creative cognition (the process of creativity) has to do with discerning relationships, which are insightful for problem-solving. Every time a person discovers the validity of a generalization, leaps to a hypothesis, perceives alternative courses of action and their consequences, and imagines a new way of living, it can be claimed that she is creative. We have discussed these forms of creative cognition in three earlier articles in this series.

A second kind of creativity emerges from the arts and humanities. Here creativity is perceived as making or doing something which expresses one's personal understanding and feelings. It makes use of

her imagination, ability to express or communicate, her moral or aesthetic sensitivities, and her knowledge of the subject of her creativity. This kind of creativity takes many forms:

poetry	songs	banners
photographs	paintings	sculpture
essays	short stories	collages
music	drama	modeling...etc.

Tradition with a New Emphasis. Now many of us will recall doing creative projects like those listed above in our geography classes of yesteryear. Many geography teachers, especially in middle and junior high schools, regularly assign poster projects, poems, and other tasks which lead to a product which is often called "creative."

But are we to call these products "creative?" Most simply replicate, and are not too original. Often they use very little knowledge of the subject under study in the course. Far too often they mislead students about what creativity is, for almost anything done counts as "creative." This is not to argue that only some elite can be truly creative, but splashing paint or words around or copying Mt. Vernon in miniature (even when "authentic") are not creative acts. Baking depression bread or carving the Titus Column from soap may well be worthy class projects, but do not count as "creative."

What then should count as creative in geography class products? Assessing any product as creative would involve each of the following five factors: (see Figure # 3)

1. Practical knowledge. The creative product ought to emerge from what students are studying in geography, employing the knowledge appropriate to that lesson or unit. It ought to be factually correct, or a prediction groundable in knowledge. Students producing a product claiming it to be creative ought to be able to explain their product as based upon geographic knowledge.

Students of outstanding artistic, dramatic, or literary ability may be able to produce outstanding products. In evaluating these products, the geography content must be the primary factor. No matter how excellent a product may be, if it does not address the learning objectives, it falls short.

2. Originality. A necessary condition of being creative is that one should produce some original work that is one's own. It must be a product of the student's own design, calculation, or work, without direct instruction or in accordance with another's direction or formulation. Simple copies or clever imitations may be valued as such and may be useful in certain settings, but they are not, by definition, to be viewed as creative.

3. Competent. Any product that is claimed to be a creative product ought to meet at least the minimum standards of competency for its kind. That is, an essay ought to have its syntax straight, its words spelled correctly, and its punctuation in order. Geographic essays ought to have their facts straight as well as meeting the standard English practices of grammar, syntax, and punctuation. As part of the creative process, students would specify the appropriate standards of competency for the creative task they are undertaking prior to undertaking it, and then, would apply those standards in judging their work upon completion.

4. Moral or Aesthetic Sensitivity. The work of creativity ought to develop out of what the students are feeling about what they are studying in geography. Not all creative works need to be expressions of passion, but moral and aesthetic values have their place. The product ought to express the producer's commitment, beliefs, values, attitudes, or emotions--they ought to be personal expressions and interpretations. In the assessment stage of the creative process, students ought to be able to articulate their expressions of belief, feeling, etc., in moral or aesthetic terms.

5. Excellence. A necessary condition of creativity is that the creative product--to be considered one--ought to meet the minimum, appropriate standards of excellence of products of its kind. Simply put, the creative process ought to yield works of quality. One of the more educational features of having students do creativity tasks is to initiate students into the standards of excellence appropriate to the activities which they undertake: writing a speech, designing a banner, preparing a short story, putting on a short drama, writing an opinion paper, or painting a mural. Spontaneous production and orginiality are not sufficient--to be valued and valuable, the product needs to be excellent in some appropriate way. Absurd, incoherent, or poor products may be clever, but are not creative. Early in the creative process, students need to list some appropriate standards of excellence to which they will strive, and which they will use to assess their output. Listing such standards of excellence is no easy chore, and students will need assistance from the school faculty.

Of course, these factors in producing creative products are demanding. Students in secondary schools will have to be introduced to them incrementally, as they develop creative products as part of their geography courses. The teacher has the responsibility to ensure that all students have equal access to materials and resources to produce an excellent product. Children from disadvantaged socio-economic backgrounds should not be hindered in achieving excellence because of limited home environments.

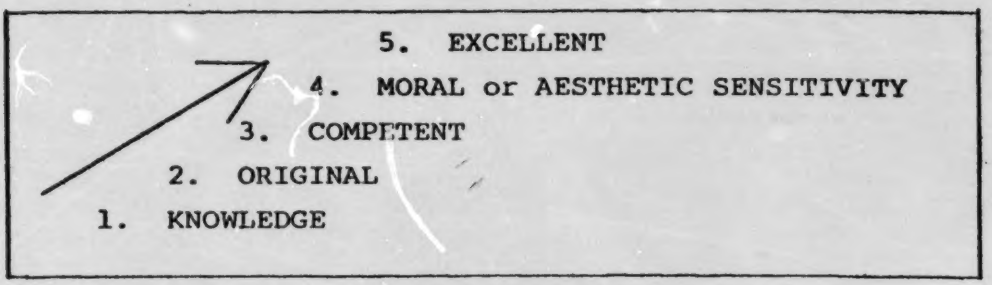

Figure #3 Hierarchy for Assessing Creative Products

The Classroom Process. Henri Poincare (1913), a mathematician, recorded some loose conditions for creativity:

1. a period of conscious work (knowledge);
2. a period of unconscious incubation; and
3. a hypothesis or insight, followed by articulation and experimentation

This sequence has been confirmed by subsequent research. There seems to be consensus that creativity involves cycles of intense study, reflection and intuition, and intense assessment and experimentation.

The classroom process follows Poincare's conditions, always assuming that assignments or opportunities to produce a creative product are part of serious study in an on-going geography course. To be creative, students always must begin by knowing something (Massialas & Zevin, 1967).

1. Warm-up and Involvment. This sets the assignment in the context of the course or unit under study. The teacher involves students in clarifying feelings, attitudes, or values about the topic under study, and checks to see that they know what will be needed in the creative production process.

2. The Problem or Challenge. The teacher presents a situation needing a creative response, or the students identify such a situation.

3. Initial Statement. The students and teacher state the problem or problems that they will be tackling. The class lists the minimum standards of competency for the creative product(s), perhaps examining several examples by others. The students also generate several, appropriate standards of excellence and understand why these standards make sense. Again, the teacher is the guide and may show examples of others' work which reflect the standards of excellence.

4. Creative Production. Students cope with creative production, developing ideas, trying them out, and redesigning. The length of time spent in this stage would vary greatly depending upon student interest, the type of task, and the students' abilities.

5. Evaluation and Communication. Students and teacher present their final "creations" to one another. This is followed by rigorous assessment of the products against the standards of competence and the standards of excellence. Whenever possible, the students should be encouraged to do something significant with their products--send to the local newspaper, display at a faculty meeting or community event, etc. As much as possible the students should enter into evaluation of their peers. If guidelines are clearly established, this can be a productive experience and heighten creative understanding. For example, it could be required that each negative comment include a suggestion for improvement and be balanced by a positive comment. Positive comments could be required to be supported with reasons why the evaluator feels good about the project.

Sample Classroom Activities.

1. In ancient Athens, citizens took the following oath:

   The Athenian Oath: "...we will strive unceasingly to quicken the public's sense of duty; that thus...we will transmit this city, not only not less, but greater, better and more beautiful than it was transmitted to us."

   Write an oath for the citizens of your community in the 1980's:

   _____

   _____

   _____

   _____

   _____

2. Make a collage on life in your area. Topics might be:

   a. people (doing things, e.g., shopping, working)
   b. traffic jam, pollution
   c. an overall collage about the quality of life

3. Assume that you are in the business of advertising. Find out what your country has that a visitor would want to do or see. Make a brochure to advertise those things, inviting people to visit the country.

4. Assume that you have just returned from visiting another city on vacation. Make a little display telling us and showing us what you did and saw. This display should make the city interesting enough to make us want to visit the city, too.

5. Assume that you work for an airline company. You have been asked to advertise a city for them. Make a travel poster to invite people to visit your country.

6. Emma Lazarus wrote the following poem about the Statue of Liberty in 1883. It was hoped that the poem would help raise moeny to put up the statue in New York harbor. The monument was completed in 1886. This poem was inscribed on the base of the statue in 1908:

The New Colossus

Not like the brazen giant of Greek fame,
With conquering limbs astride from land to land;
Here at our sea-washed, sunset gates shall stand
A mighty woman with a torch, whose flame
Is the imprisoned lightning, and her name
Mother of Exiles. From her beacon-hand
Glows world-wide welcome; her mild eyes command
The air-bridged harbor that twin cities frame.
"Keep ancient lands, your storied pomp," cries she
With silent lips. "Give me your tired, your poor,
you huddled masses yearning to breathe free,
The wretchedrefuse of your teeming shore.
Send these, the homeless, tempest-tost to me,
I lift my lamp beside the golden door."

Write a poem or song expressing your feelings about new residents who plan to move into your country between now and the year 2000 AD.

7. One author wrote the following paragraph about urban areas:

"The large city has outlived its usefulness. New York, for example, features overcrowding, inadequate municipal services, air and water pollution, crime in the streets, ethnic clashes, and widespread poverty. Even its cultural life is artificial, for it is restricted to the educated few, and it drains the rest of America of its promising young talent. It is a bad place to

live: it's even becoming a bad place to visit."

Write a speech to express your agreement of disagreement with her judgment.

8. Plan a community in a setting. How would you take care of waste, power, schools and other community needs? Divide the class into small groups and have each group design a community of a given size, then have the groups compare their ideas and priorities.

9. Have a contest in your classroom or school to see what the students could create using things which are usually "thrown away" such as egg cartons, plastic jelly holders from restaurants, milk cartons. (Example: take the jelly holders to the elementary schools and they can be used to hold paint, cartons could be used to hold brushes.)

10. Draw a picture of "an environmental villain." Write a paragraph explaining why you chose this particular villain.

11. Pretend that you are a fish in a polluted lake. Express what your life would be like. Next, dramatize how your life is affected by your environment.

12. Using four colors (crayons, chalk, etc.), draw a picture that expresses how you feel about your nature. Discuss your drawing with the rest of the class. "What does it mean to you?" "How does it express your views?"

13. Television has many model formats that lend themselves to geographic content. Programs like "60 Minutes," "20-20" and similar news and talk show presentations provide a fertile field for students to address geographic content. This kind of project could provide a pertinent wrap-up of any one of a number of units. With the advent of video cameras and recorders, the teacher must be careful to insure that form does not overwhelm content if the students elect to use such equipment.

The role of the teacher is to help the students to be creative not only by providing the proper atmosphere, but also by exposing the student to models of creativity so that they may find those avenues that enable them to express their own creativity in appropriate products.

Classroom Climate. The ideal classroom climate to foster student creativity is open, supportive, and rewarding. Too much stress upon "getting the right answer" is inhibiting. Peer and teacher pressure can cut spontaneous responses. When planning geography

units, teachers need to build in opportunities for being creative and honor those students who develop creative products. Opportunity to be creative, encouragement to be creative, and reward for being creative are the Trinity of principles for fostering creative learners in the social studies (Torrance, 1964).

Conclusion. We have not argued here that students should scribble away or splash paint about in the pursuit of happiness, originality, or "authenticity." We have argued for creativity activities in geography which are disciplined to the goals and function of instruction. Mere doodles do not count for much.

Teachers can readily develop one creativity activity for each chapter or unit in the geography textbook as a beginning point. The activities suggested in this article, and the procedures, are meant to spur on the imagination of our colleagues in geography classrooms. No teacher should find our suggestions foreign to his or her course objectives. The opportunities to develop creative students are there in our textbooks and course outlines. It is only left to concerned teachers to seize these opportunities and build creativity activities into the instructional sequence. To do less is to fail to take seriously our interest in educating creative citizens.

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